



Energy, CO₂, Climate, and YOU!

Dr. Steve
(Doctor of Chemistry)
Stephen E. Schwartz

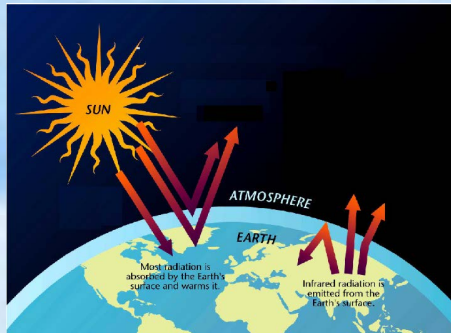
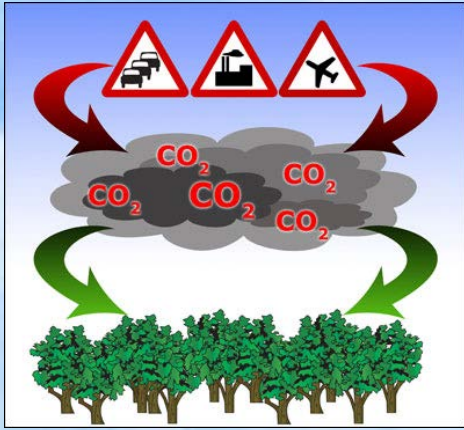
BROOKHAVEN
NATIONAL LABORATORY

COPIAGUE

Middle School

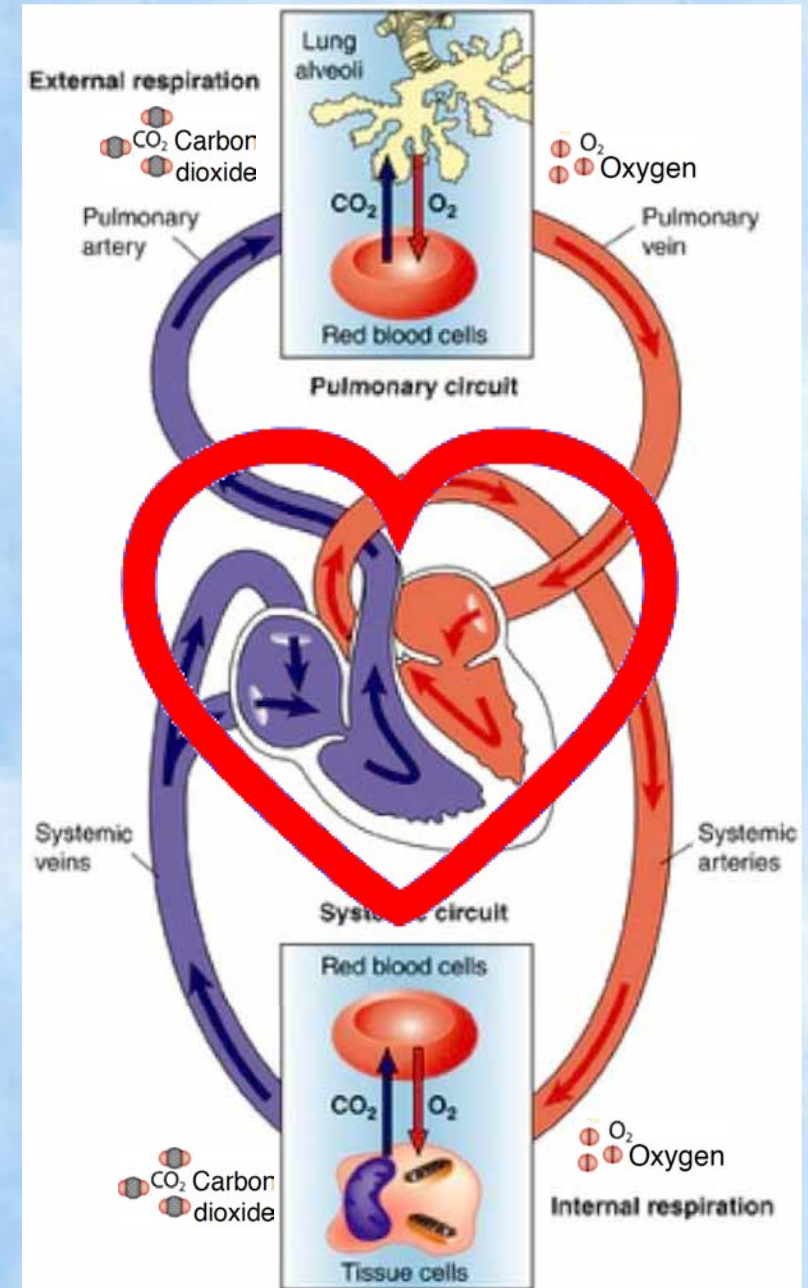
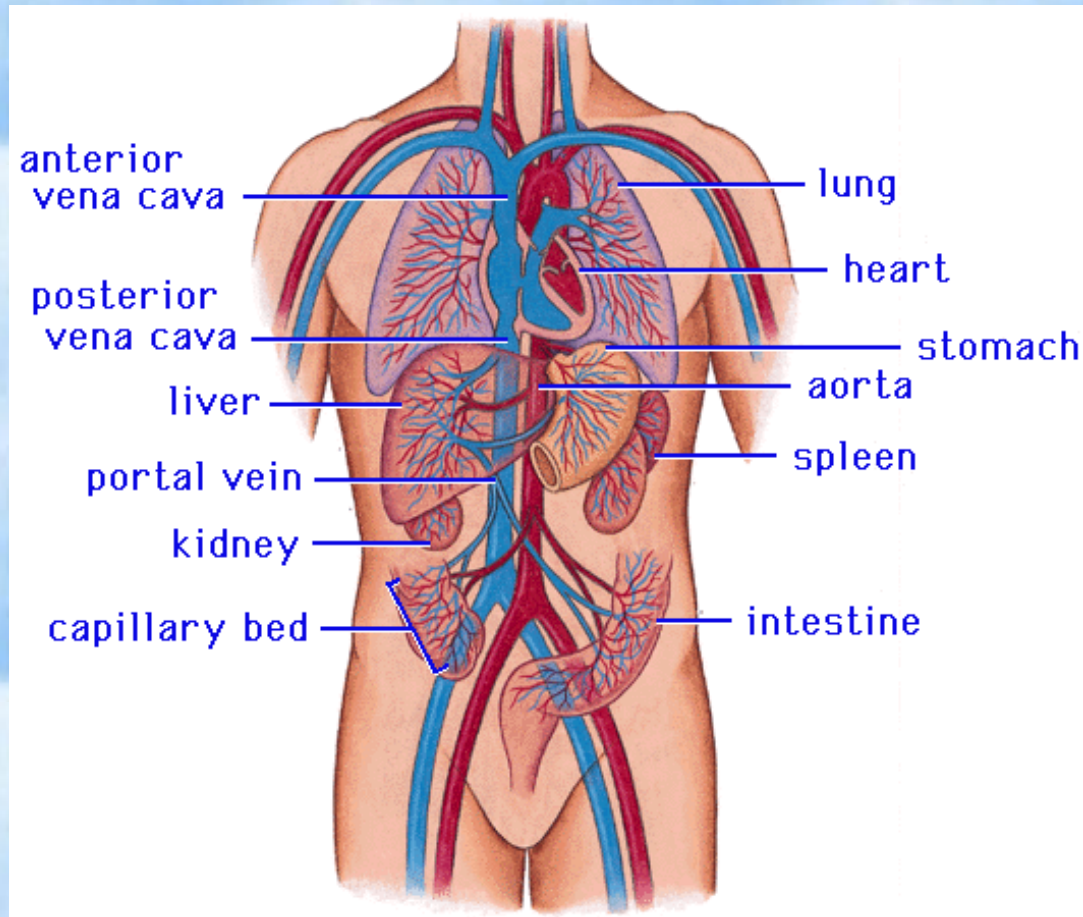
April 27, 2016

www.ecd.bnl.gov/steve



WHERE DO YOU GET
YOUR ENERGY?

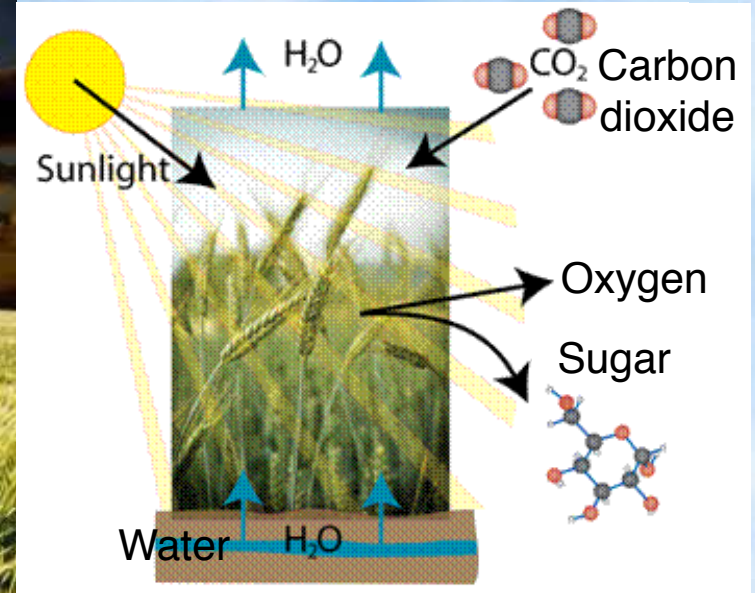
HOW DO ENERGY (AND OXYGEN) GET TO YOUR MUSCLES?



<http://library.thinkquest.org/5777/cir1.htm>

<http://newstt.com/how-is-circulatory-system-and-the-digestive-system-related/>

WHERE DOES YOUR FOOD GET ITS ENERGY?



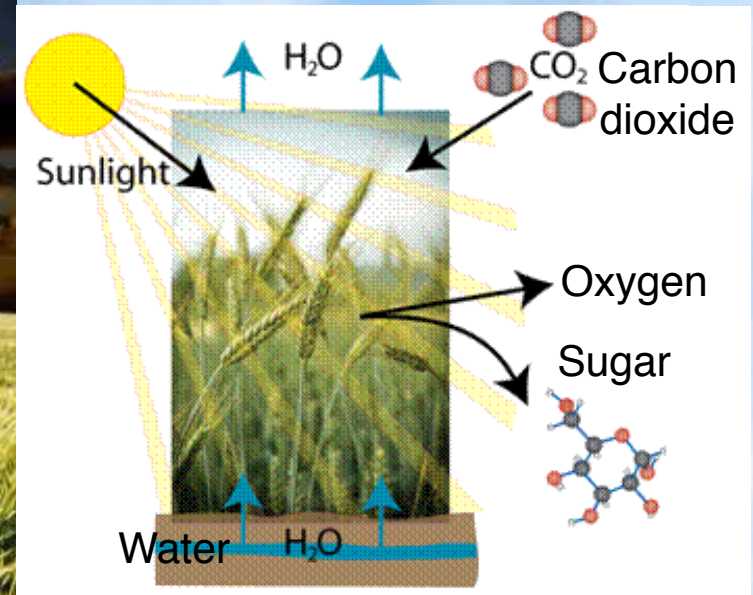
www.ems.psu.edu/~pisupati/ACSO outreach/Petroleum_1.html

www.desktopwallpaperhd.com

WHERE DOES YOUR FOOD GET ITS ENERGY?



www.desktopwallpaperhd.com



[www.ems.psu.edu/~pisupati/ACSO Outreach/
Petroleum_1.html](http://www.ems.psu.edu/~pisupati/ACSO Outreach/Petroleum_1.html)

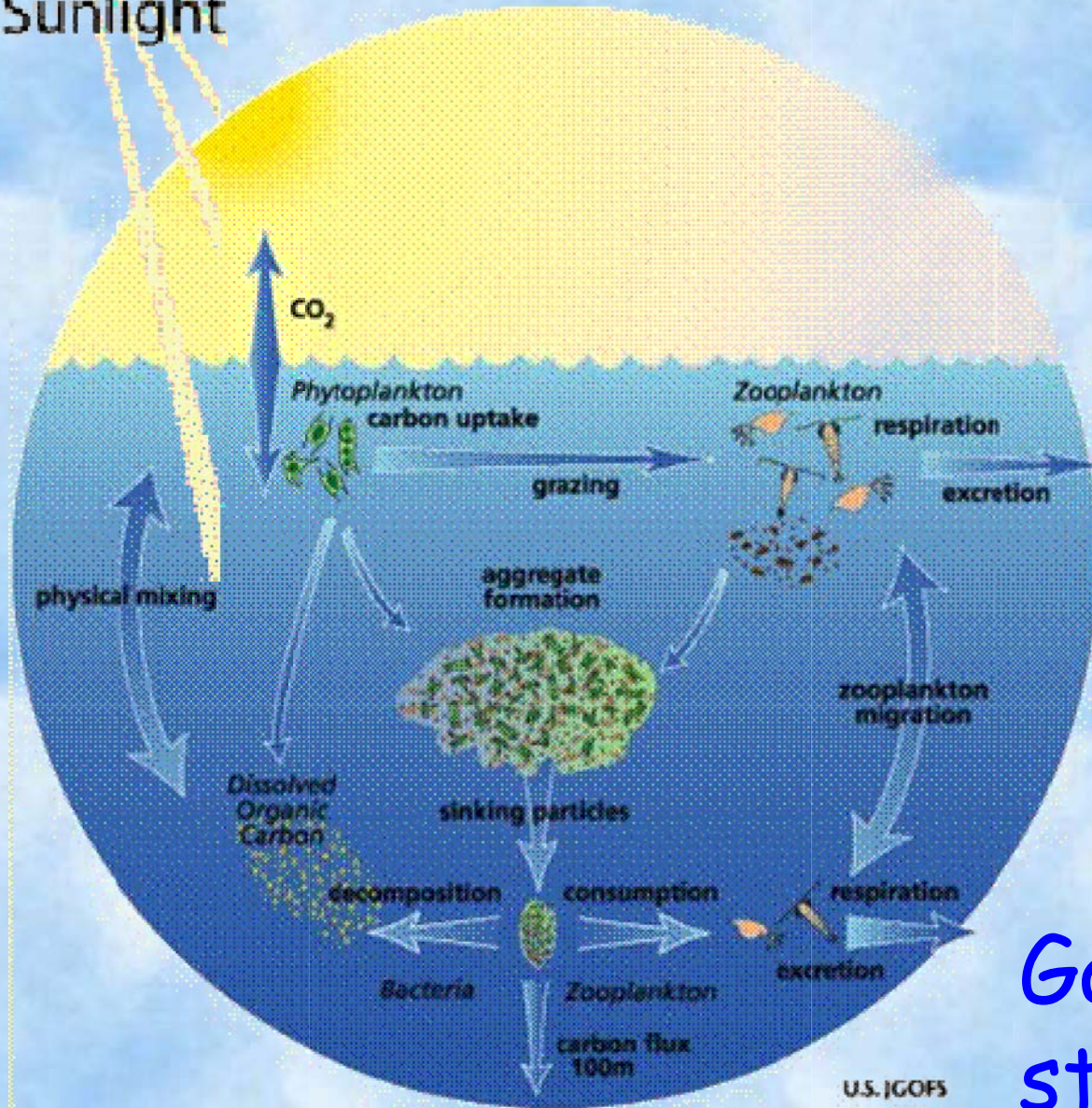
Food is stored solar energy.

WHERE DOES YOUR CAR GET *ITS* ENERGY?

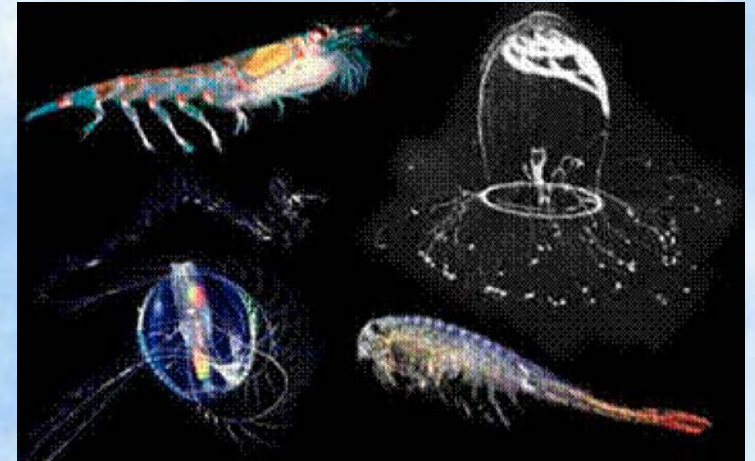




WHERE DOES GASOLINE GET *ITS* ENERGY?



U.S. JGOFs



Gasoline is also stored solar energy.

We burn fossil carbon fuels to . . .



*Heat our
homes*

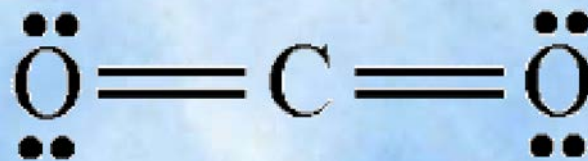
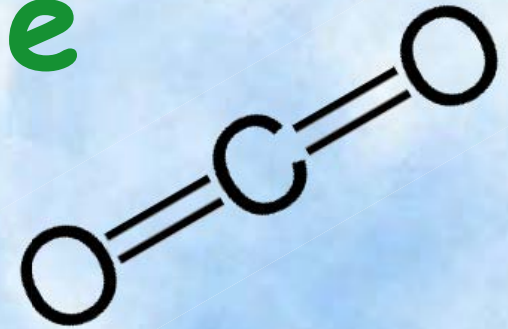
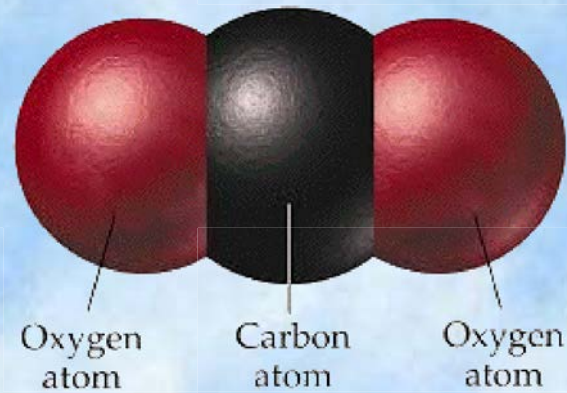
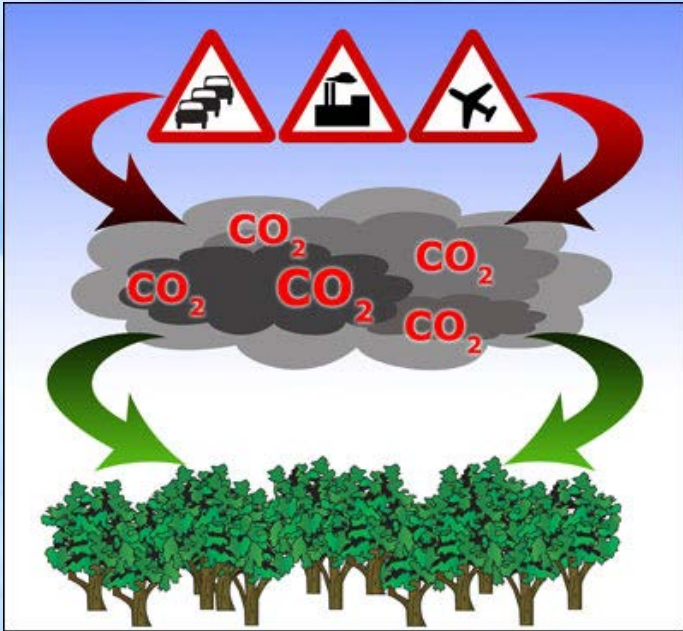


Generate electric power

*Move goods and people
from here to there*

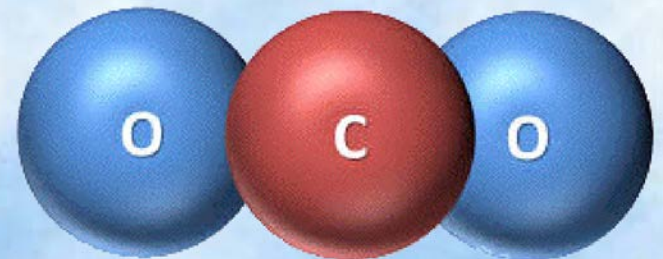
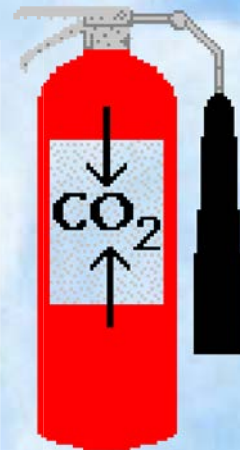


Carbon Dioxide

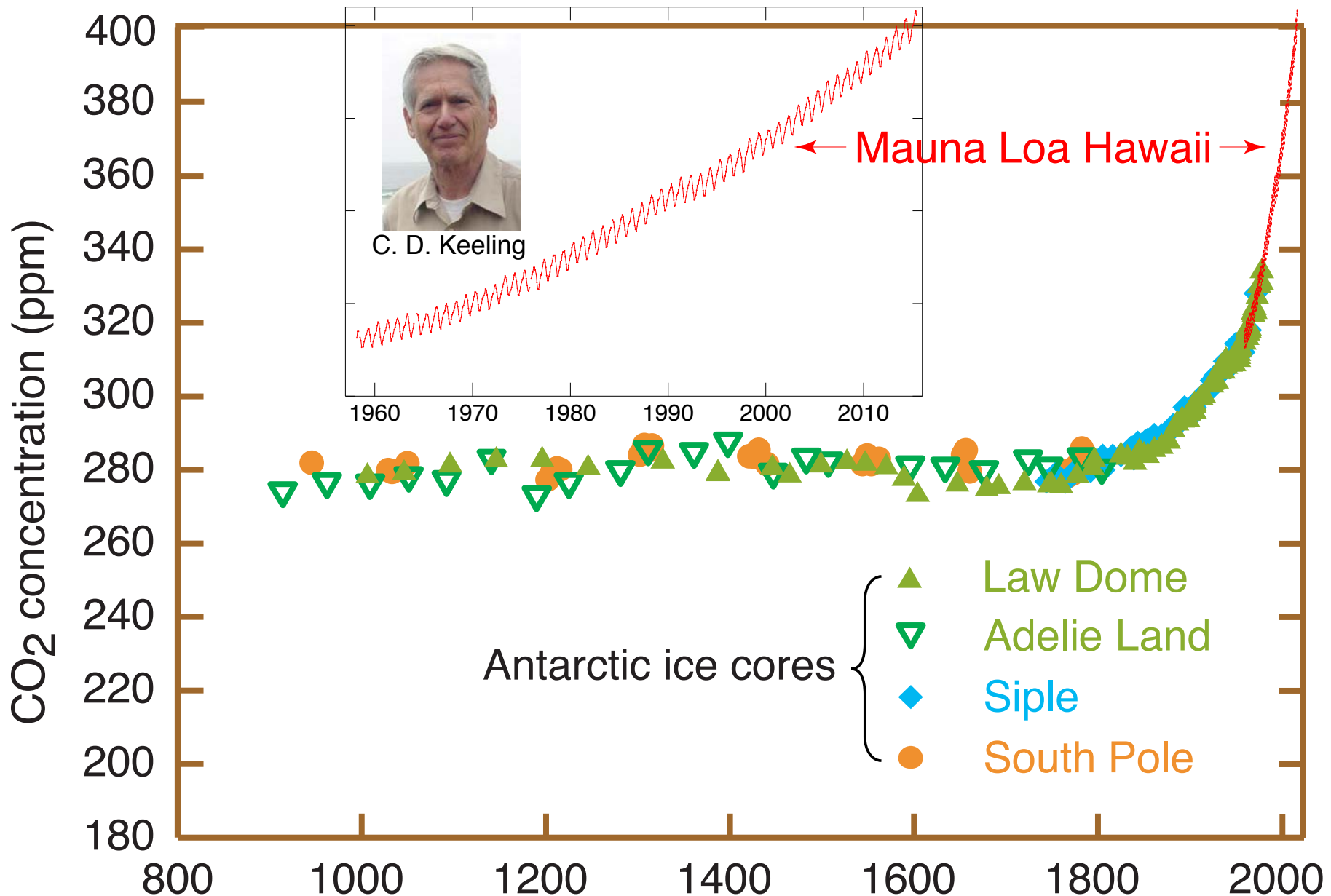


CAUTION
CARBON
DIOXIDE

DANGER
CARBON
DIOXIDE



ATMOSPHERIC CARBON DIOXIDE IS INCREASING



Global carbon dioxide concentration over the last thousand years

GLACIERS ARE OUR TIME MACHINE



New York Times, July 2, 2012

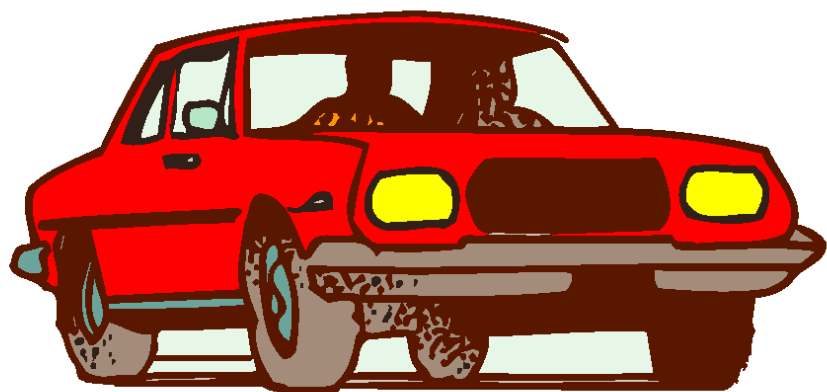
Lonnie Thompson, Ohio State University glaciologist, studies Earth's climate history by the ice archive.

***WHERE IS ALL
THIS CO₂
COMING FROM?***

***WHO IS
RESPONSIBLE?***

WHERE IS THIS CARBON DIOXIDE COMING FROM?

WE ARE ALL RESPONSIBLE.



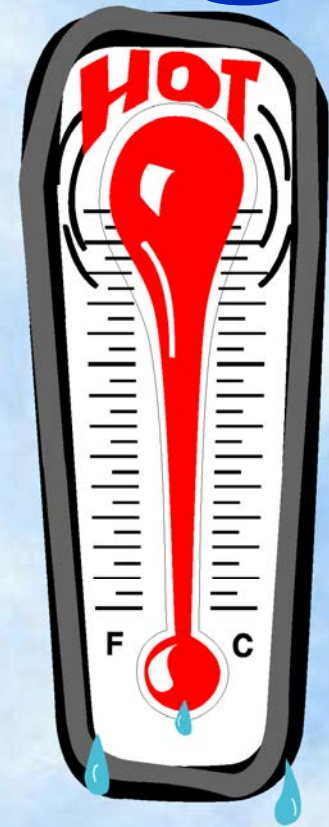
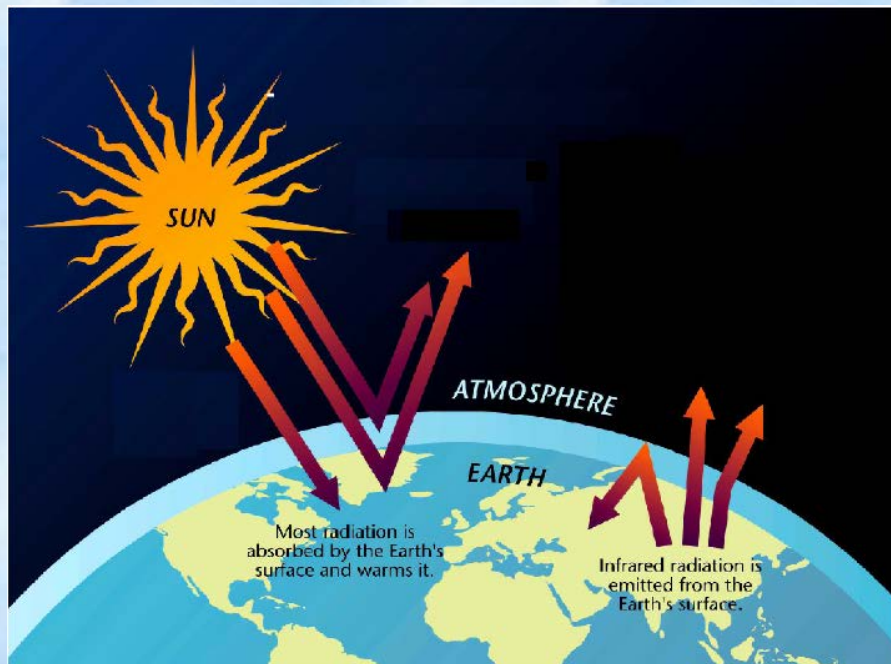
Burning a gallon of gasoline in your car puts 5 pounds of carbon in the atmosphere as carbon dioxide (CO_2), and it will stay there for decades — maybe a century!

Other sources are home heating and electric power production.

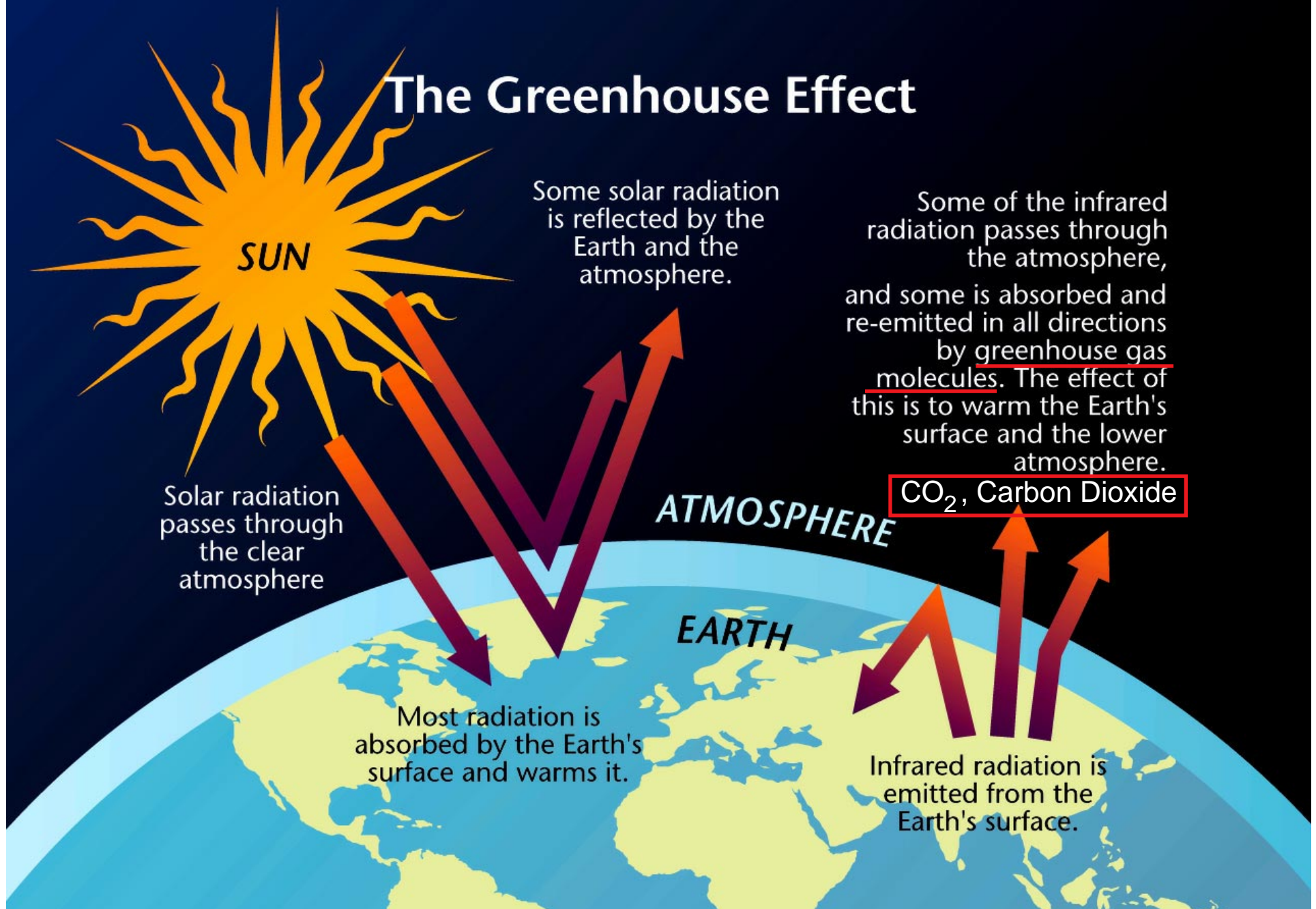


Climate change

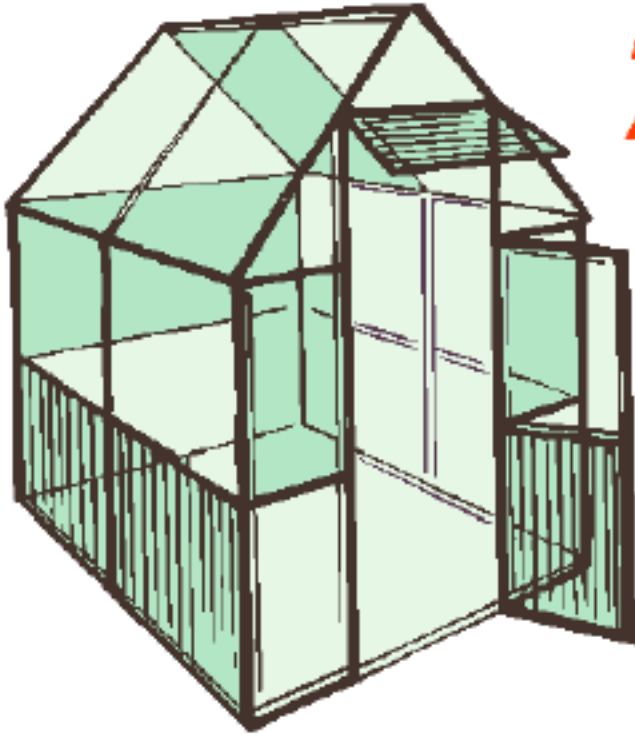
The Greenhouse Effect



The Greenhouse Effect



THE GREENHOUSE EFFECT



EARTH'S ENERGY BUDGET: A DELICATE BALANCE

- Sunlight heats the Earth.
- The warm Earth radiates energy (in the form of infrared radiation, or heat) back out to space.
- Some of this infrared radiation is trapped in the atmosphere, giving Earth its temperate climate.

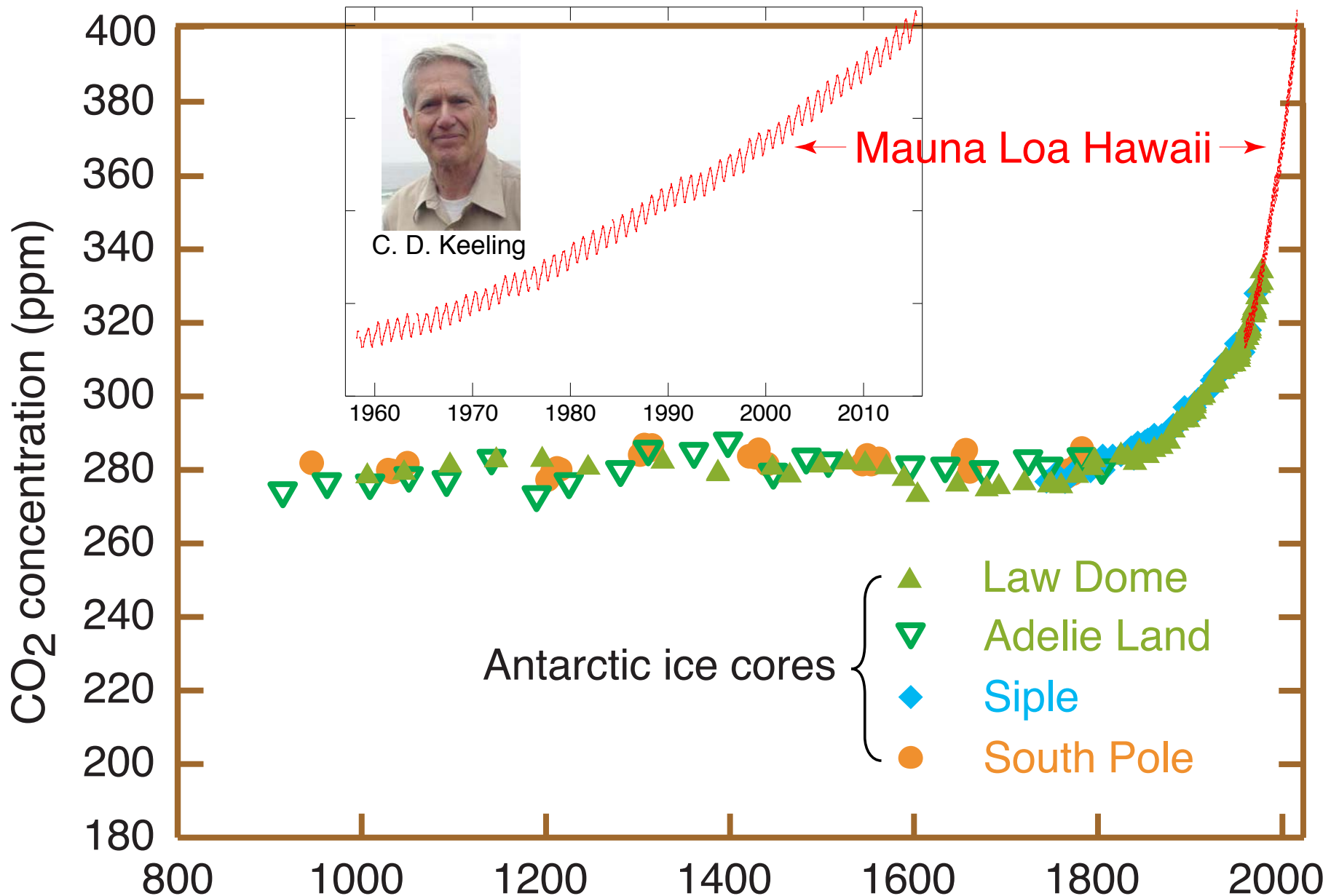
This is the greenhouse effect.

Global average temperature 15°C or 59°F

Without it, the Earth's climate would be like the moon's, harsh and severe.

Global average temperature -19°C or -2 °F

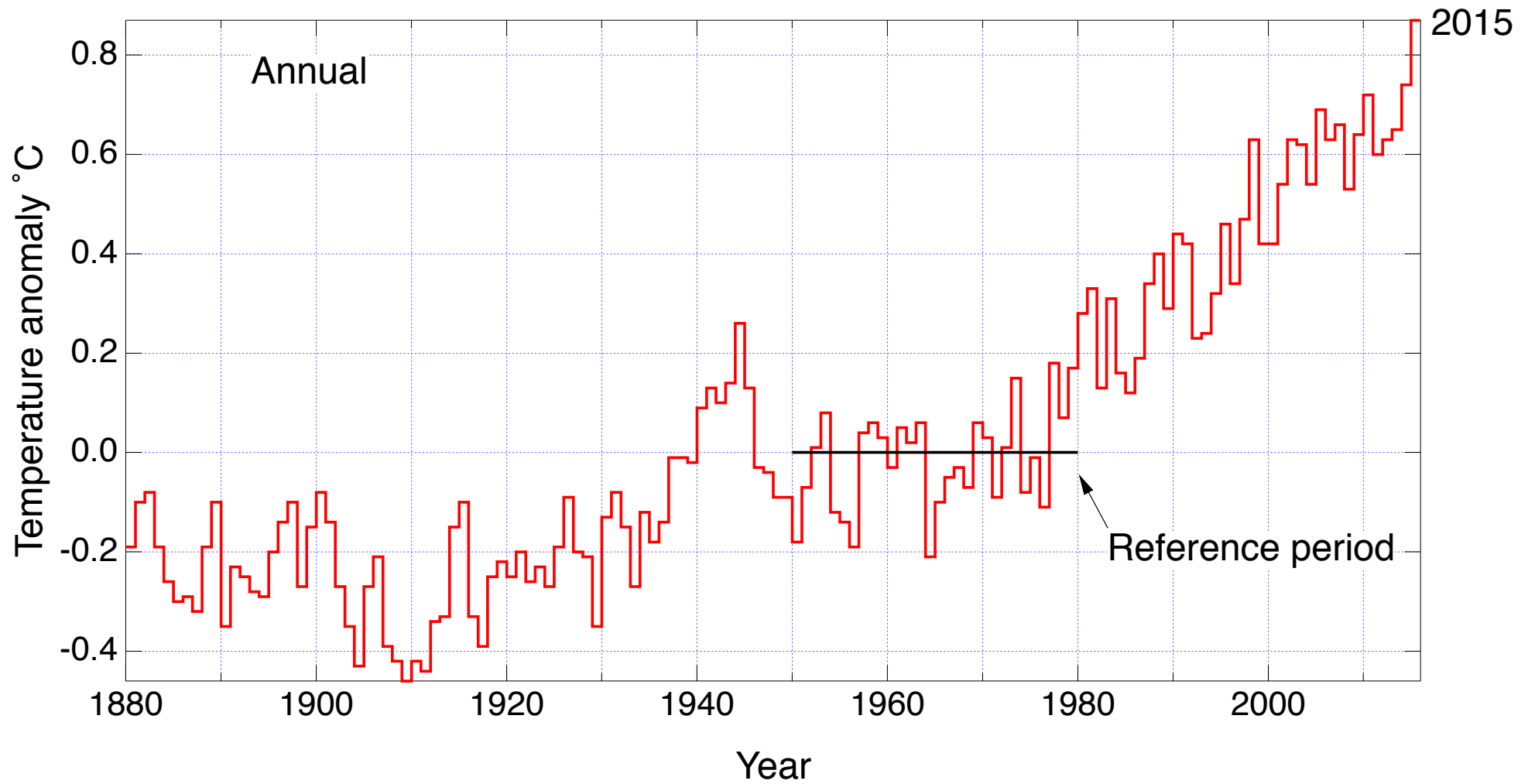
ATMOSPHERIC CARBON DIOXIDE IS INCREASING



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Too much of a good thing?

GLOBAL TEMPERATURE CHANGE SINCE 1880



NASA, Goddard Institute for Space Studies

2015 was the hottest year on record.

14 of the hottest 15 years have been since 2000.

THE NEW NORMAL?

Souris River, Minot, North Dakota, June, 2011



The river surpassed its 1881 record level of 1,558 feet above sea level, and flooded an estimated 4,000 homes in the city.

THE NEW NORMAL?

Tornado, Moore, Oklahoma, May, 2013



THE NEW NORMAL?

Tornado, Moore, Oklahoma, May, 2013



THE NEW NORMAL?

Colorado Springs, June, 2013



Are spring wildfires the new normal?

SUPERSTORM SANDY – THE NEW NORMAL?

Breezy Point, Queens, NYC



SUPERSTORM SANDY – THE NEW NORMAL?

Hoboken NJ



SANDY ON LONG ISLAND – THE NEW NORMAL?



IS THERE
ANYTHING
WE CAN DO?

SOLAR PHOTOVOLTAIC ENERGY

Decrease your carbon legacy by generating your own electricity



Decrease your electric bill, too; maybe even to zero!

POWER YOUR CAR WITH SOLAR ELECTRIC ENERGY, FOR FREE



THANK YOU!

Dr. Steve

